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Noble Fir



Forest Service

U. S. DEPARTMENT OF AGRICULTURE

NOBLE FIR

(*Abies procera*)

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Noble fir is one of the eight true firs¹ that grow in the western part of the United States, and the most important as a source of high-grade lumber. It grows principally in Washington and Oregon on the western slope of the Cascade Range. The stand of noble fir of saw-timber size (between 8 and 9 billion board feet) is about three-quarters that of Sitka spruce—a species which also grows principally in western Oregon and western Washington. Noble fir trees attain large size and occasionally a height of over 200 feet and diameter of 7 feet. Under favorable forest conditions, the trunks of trees of merchantable size are straight and often clear of branches for 100 feet or more. Such trees contain a high proportion of lumber of the select grades—more than any of the other true firs.

The wood is light in weight and color and, like white fir and grand fir, has an intermediate rank in strength properties as compared with other woods. Much larger pieces of clear, straight-grained material can be obtained from noble fir than from the other true firs. Until recent years, only small quantities of noble fir timber were cut for commercial purposes, partly because of the established reputation of competing woods and partly because of the comparative inaccessibility of noble fir stands. Practically all of this cut was manufactured into lumber, used principally for planing-mill products and boxes. Specialty uses which have done much to build up the reputation of the wood are venetian blinds and ladder rails. The established suitability of noble fir for aircraft construction brought about a marked increase in the production of this wood during World War II.

Nomenclature.—Noble fir is known also as larch, a name that is unfortunately quite common among lumbermen and timber cruisers, and is the cause of considerable confusion because it is also the commonly accepted name of western larch (*Larix occidentalis*). Noble fir trees do not resemble larch, and the woods of the two species differ markedly in appearance, properties and suitability for various uses. Noble fir is also called white fir, and occasionally red fir.

Distribution and growth.—Noble fir grows chiefly on the west slope of the Cascade Range in western Washington and western Oregon, and sparingly on the coastal ranges of western Washington and western Oregon and in the Olympic Mountains of northwestern Washington (fig. 1). It is also reported to occur in northern Cali-

¹The term "true firs" is used for species of the genus *Abies* to distinguish them from Douglas-fir (*Pseudotsuga taxifolia*), not a closely related species. There are 10 species of true firs native to the United States. Eight of these grow in the West and 2 in the East. The western true firs are white fir (*Abies concolor*), grand fir (*A. grandis*), California red fir (*A. magnifica*), Pacific silver fir (*A. amabilis*), noble fir (*A. procera*), alpine fir (*A. lasiocarpa*), corkbark fir (*A. lasiocarpa* var. *arizonica*), and bristlecone fir (*A. venusta*). The eastern true firs are balsam fir (*A. balsamea*) and Fraser fir (*A. fraseri*).

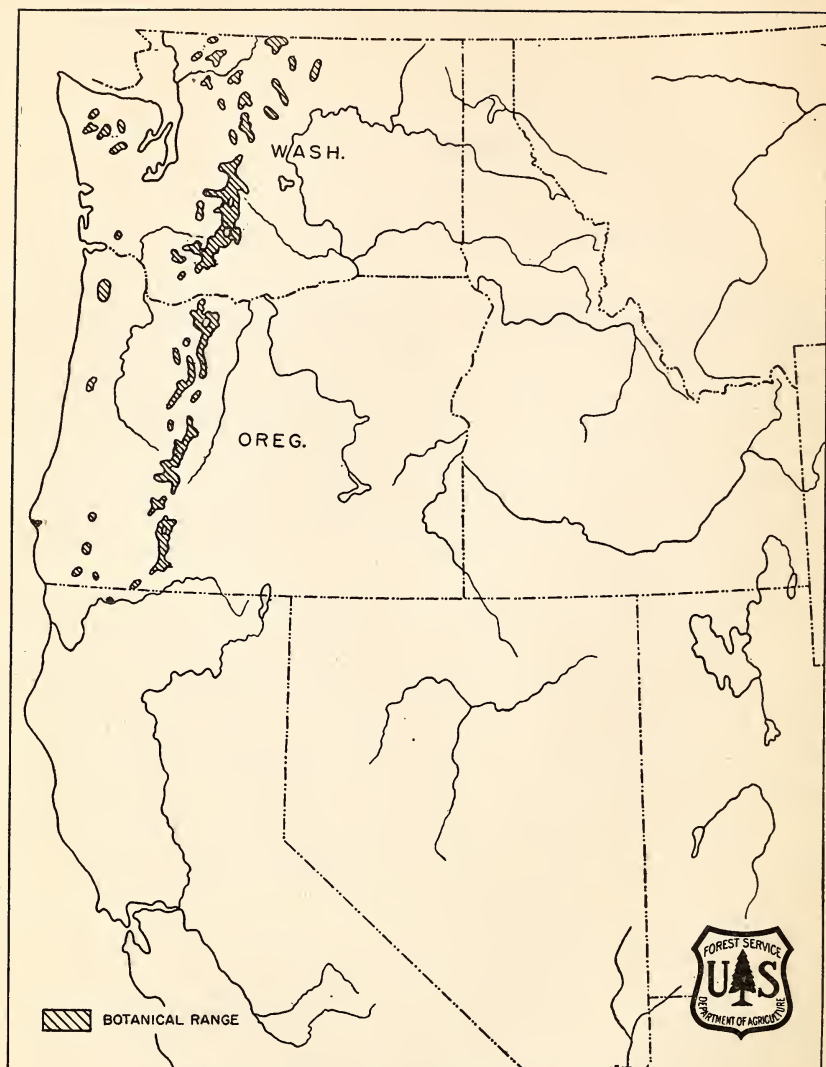


FIGURE 1.—Range of noble fir (*Abies procera*).

fornia. At the southern limits of its growth it overlaps the northern range of Shasta red fir (*Abies magnifica shastensis*)—a form of California red fir which it very closely resembles and with which it is frequently confused.

The altitudinal limits of noble fir generally lie between 3,000 and 4,500 feet above sea level. In the northern part of its range, these limits are somewhat lower and in the southern part somewhat higher. Its extreme botanical limits are from an altitude of about 1,000 feet to over 6,000 feet. Noble fir rarely occurs in pure stands of even small

extent, but generally in mixture with Western hemlock, Douglas-fir, Pacific silver fir, and Western white pine. At the upper altitudes there are frequently additional species present in the mixture, including alpine fir, mountain hemlock, lodgepole pine, and Alaska yellow-cedar, while Douglas-fir is often absent.

Noble fir grows best in deep soils on cool sheltered flats or moderate slopes; at elevations between 3,000 and 4,000 feet where there is an annual precipitation of 60 inches or more, much of it in the form of snow, and the atmosphere is cool and humid. In a mixed stand of noble fir, Douglas-fir, and Western hemlock on the western slope of the Cascade Range in northern Oregon the average size of noble fir trees grown under favorable conditions was as follows:² age 10 years, height 4 feet; age 20 years, height 12 feet, diameter 3.1 inches; 50 years, height 53 feet, diameter 11.1 inches; 100 years, height 99.5 feet, diameter 20.5 inches; 200 years, height 145.5 feet, diameter 33.2 inches; 400 years, height 196.3 feet, diameter 49.4 inches. Some of the trees in the stand measured were 6 feet in diameter. The tree forms a tall, straight, slowly tapering stem which readily clears itself of side branches for a considerable distance above the ground. Trees of commercial size are frequently clear of branches for two-thirds or three-quarters of their height.

Noble fir produces seed at infrequent intervals. The seeds are winged and disseminated chiefly by the wind. Reproduction takes place only in openings in the forest where moisture conditions are favorable. At no time in its development can noble fir endure heavy shade. The bark is very thin, and trees of all ages are readily killed by fire. Overmature trees are frequently damaged by fungi, especially by the Indian paint fungus (*Echinodontium tinctorium*). Damage by insects seldom occurs.

Supply.—The total stand of noble fir of saw-timber size in the United States was estimated in 1940 at 8.6 billion board feet. This figure is made up of 3 billion feet in Washington and 5.6 billion feet in Oregon and comprises about 7 percent of the total estimated stand of the eight western true firs.³

Production.—The amount of noble fir lumber produced annually has not been listed separately in the lumber production statistics of the Bureau of the Census, but has been included under "white fir," together with five other species of western true firs.⁴ For the 10-year period 1934–1943 about 25 percent of the average annular cut of "white fir," amounting to approximately 40,000,000 board feet, has come from Washington and Oregon where noble fir grows. Included in this figure is the lumber produced from noble fir and several other true firs which grow in commercial quantities in these two States. It is not known what proportion of the annual production of lumber

² HANZLIK, E. J. A PRELIMINARY STUDY OF THE GROWTH OF NOBLE FIR. JOUR. Agr. Res. 31: 929–934, illus. 1925.

³ These estimates for the stand of noble fir are based on:

ANDREWS, H. V., and COWLIN, R. W. FOREST RESOURCES OF THE DOUGLAS-FIR REGION. U. S. Dept. Agr. Misc. Pub. 389, 169 pp., illus. 1940.

COWLIN, R. W., BRIEGLIEB, P. A., and MORAVETS, F. W. FOREST RESOURCES OF THE PONDEROSA PINE REGION. U. S. Dept. Agr. Misc. Pub. 490, 99 pp., illus. 1942.

Other findings of the Pacific Northwest Forest and Range Experiment Station of the U. S. Forest Service.

For a comparison of the stands of the various western true firs, see American Woods Series, leaflet on White Fir.

⁴ Two of the eight species of western true firs, bristlecone fir and corkbark fir, occur only in negligible amounts and are not cut for lumber.

from the true firs in Washington and Oregon for this 10-year period was noble fir, but a rough estimate would be about one-quarter or an average annual production of approximately 10,000,000 board feet. After the acceptance of noble fir in 1941 by both American and British engineers as a wood suitable for aircraft construction, there was undoubtedly a marked rise in its production. In 1942 Washington and Oregon produced approximately 71,000,000 board feet of "white fir" lumber; probably 50 percent or more was noble fir. Estimates for 1943 indicate a cut of noble fir for that year of approximately 77,000,000 board feet.⁵

Properties.—The sapwood of noble fir is not distinguishable from the heartwood. The wood is white, with a reddish brown or pinkish tinge. The growth rings are distinct and consist of a band of pale-reddish springwood which merges into a darker band of summerwood. It has not so far been possible to distinguish the wood of noble fir from that of the other true firs by its appearance or microscopic structure. To identify the species it is necessary to examine the foliage.

The wood is generally straight-grained, without taste or odor when dry, light in weight,⁶ and has a moderately large shrinkage. In mechanical properties it is rated as moderately weak in bending and compressive strength, stiff, moderately soft, and moderately low in shock resistance—values quite similar to those of Sitka spruce. Recent reports and observations⁷ indicate that it has satisfactory working qualities and little tendency to warp or split when used for rather exacting purposes. Noble fir lumber, like that from the other true firs, has a high moisture content⁸ when first sawed from the log and requires a proportionately long time to dry. Such information as is available on kiln drying noble fir indicates that it can be dried satisfactorily by the same methods used for Sitka spruce, although a longer time may be required owing to the higher initial moisture content. The wood probably is close to white fir and grand fir in nailing properties, with little tendency to split under the action of nails but with low nail-holding ability.

The heartwood of noble fir is difficult to treat with a preservative. In ability to take and hold paint, noble fir has a good reputation but the results of systematic paint tests on this wood are not available.

Noble fir, like the other true firs, is well adapted to the manufacture of paper pulp.⁹ It reduces readily by the sulfite process to produce an easily bleached pulp of excellent color and strength with fine, tough

⁵ It is highly probable that the cut of noble fir will drop considerably when the demand for aircraft lessens.

⁶ The average weight of noble fir in an air-dry condition (12 percent moisture) is 26 pounds per cubic foot.

⁷ Findings of the Forest Products Laboratory of the U. S. Forest Service.

⁸ Probably about 100 percent. This means that one-half the weight of green lumber is water and one-half wood. The moisture content is calculated on the basis of the dry wood.

⁹ Six processes are used commercially in making paper pulp from wood. One is the mechanical or ground-wood process, in which the wood is reduced to pulp on a grindstone. The yield approaches 100 percent of the weight of the wood. Four are chemical processes—the sulfite, sulfate, soda, and neutral sulfite. They depend upon the dissolving action of chemical reagents which remove essentially all of the binding material (lignin) surrounding the cellulose fibers and leave them in a fairly pure state. The removal of the lignin is accomplished by cooking the wood chips with the proper chemical under steam pressure. The yield of pulp is about one-half the weight of the wood. In a sixth process, the semichemical, part of the lignin is removed by chemical means, and the resultant pulp, containing some lignin, is further refined by mechanical means. The yield of semichemical pulp is intermediate between the yields obtained with the mechanical process and the chemical processes.

fibers, suited to the manufacture of news, wrapping, book, and high-grade printing papers. It also reduces readily by the sulfate process to yield a strong pulp suitable for high-grade kraft wrapping paper and fiberboard. By the mechanical process it yields a pulp of excellent color and standard strength suited for practically all uses requiring ground wood.

Principal uses.—Noble fir is used principally for lumber and to a very limited extent for paper pulp. The high-grade lumber has gone largely into interior finish, mouldings, siding, and sash and door stock. During World War II the most exacting use for the highest grade material was aircraft construction. Other special and also exacting uses for the highest-grade material are venetian blinds and ladder rails, which require material that will stay in place after seasoning and can be obtained in long, clear, straight-grained pieces of uniform quality. Ladder stock must also meet certain strength requirements. Some of the lower-grade noble fir lumber is used for boxes. The light color, light weight, freedom from odor when dry, and satisfactory nailing properties make the wood well suited for various containers, including those for food products.

REFERENCES

- AMERICAN FOREST TREES—NOBLE FIR OR OREGON LARCH. Hardwood Rec. 25 (4): 16-17, illus. 1907.
- FOREST TREES OF THE PACIFIC COAST. W. A. ELIOT. 565 pp., illus. New York. 1938.
- FOREST TREES OF THE PACIFIC SLOPE. G. B. SUDWORTH. U. S. Dept. Agr. Unnumbered Pub., 441 pp., illus. 1908.
- MECHANICAL PROPERTIES OF NOBLE FIR SAMPLES. A. W. DOHR. U. S. Forest Serv., Forest Prod. Lab. 1941. (Unpub. Rpt.)
- NOBLE FIR FOR "LARCH." J. E. LODEWICK. Timberman 36 (7): 16-17, illus. 1935.
- A PRELIMINARY STUDY OF THE GROWTH OF NOBLE FIR. E. J. HANZLIK. Jour. Agr. Res. 31: 929-934, illus. 1925.
- TREES AND FORESTS OF WESTERN UNITED STATES. E. J. HANZLIK. 128 pp., illus. Portland, Oreg. 1928.
- TEXTBOOK OF DENDROLOGY. W. M. HARLOW and E. E. HARRAR. 527 pp., illus. New York. 1937.

